Project Proposal

PROJECT BUSINESS CASE

PROJECT NAME: 2D/3D Orthophotography
PROJECT SHORT NAME: 2D/3D
AGENCY: Department of Transportation
BUSINESS UNIT/PROGRAM AREA: Design Division
TYPE OF PROJECT:

☐	New Initiative
X	Major Enhancement/upgrade
☐	Application replacement
☐	Ongoing Initiative

DATE: January 31, 2005
VERSION: none

PROJECT DESCRIPTION:
To purchase hardware and software needed to migrate from optical mensuration to digital mensuration in Surveys and Photogrammetry. To provide Surveys and Photogrammetry with needed 3-D capabilities to complete highway projects sooner and replace outdated stereoplotter equipment. To provide the Design Division tools to benefit from the byproducts and capabilities available in Surveys and Photogrammetry. This will be done through the following purchases.

1. To purchase seven (7) Z/I Imaging SSK softcopy kit workstation add-on equipment and software to seven (7) existing CADD workstations. Three (3) are for Surveys & Photogrammetry, two (2) are for hydraulic analysts, and two (2) are for designers.

2. To purchase seven (7) CRT monitors for the above listed workstations.

3. To purchase a network license for thirty (30) Z/I Imaging "Image viewer" software packages, to be used on existing CADD MicroStation workstations in Design and Bridge Divisions to provide image back-drop for
screen-based digitizing and vector update.

4. To purchase Z/I Imaging "GeoMedia Terrain" software to be used on Surveys & Photogrammetry's existing ImageStation workstation.

BUSINESS NEED/PROBLEM:
Surveys and Photogrammetry Section of the Design Division, is responsible for coordinating and/or conducting the preliminary surveys for the Department of Transportation and for creating right of way plats for the Department. Surveying in the Department of Transportation can be broken down into a number of different types. They are: Geodetic (first order surveys), Photogrammetric, land (Metes-and-Bounds surveys), boundary, bridge, and construction. Surveys and Photogrammetry does all of the above types of surveying except construction surveying.

To complete their assignments, they must use complex surveying and photogrammetry equipment. Because of recent engineering and surveying administrative rules changes, they are responsible for doing more work on highway projects, without increased staff to complete the tasks. Also the number of projects they are responsible to complete has increased. One area where the workload has increased is in stereoplotting. They have two stereoplotters. One is an optical plotter (P-33) and the other is a Digital plotter (ImageStation).There is only one operator that can operate the optical stereoplotter efficiently. The

problem is the P-33 stereoplotter is now obsolete. If certain parts break, the stereoplotter can not be repaired due to a lack of replacement parts. If the stereoplotter operator gets sick, or leaves, the department does not have a backup person to take his place. An applicant for the position must take a stereovision test to determine if the individual can see stereo and measure accurately. A large number of applicants fail this test. If an individual is found that can accurately see stereo, it will take six (6) months or longer to train the individual to be proficient in doing this work. This type of technology is out of date. Support for optical equipment is getting scarce. The current technology is to use digital imagery on digitally capable equipment.

The Hydraulics analysis staff in the Design Division needs the ability to look at highway drainage patterns on aerial photographs in stereo. They currently can view contact prints in stereo through an instrument called a stereoscope. This instrument does not allow making measurements to determine elevations and slopes. The contact prints allow for only a fixed magnification. The magnitude of erosion problems are hard to see and determine under this system.

Imagery, in one form or another, is appearing in all geoengineering disciplines. We live in a 3-D world. We see things in 3-D, yet we are taught to convert 3-D into 2-D. This includes the design of highways. The effects of the design may not always be apparent when we do this. There is a need to work in 3-D to create better designs. This means seeing the effects of the design in 3-D on a digital stereo photo image.

SOLUTION (as described in proposed solution):
Purchase network license for thirty (30) Image Viewer display tool software. This is an image display tool used with orthophoto's and map-registered imagery.
Purchase three (3) SSK Professional softcopy kits. This is a combination of hardware and software that runs on existing user-supplied computers, enabling stereo roam, on-the-fly epipolar resampling, inline JPEG compression/decompression, and DTM collection.
Purchase four (4) SSK Standard softcopy kits. This is a combination of hardware and software that runs on existing user-supplied computers, enabling stereo roam, on-the-fly epipolar resampling, and inline JPEG compression/decompression.
Purchase one (1) GeoMedia Terrain (with Active Terrain and Active Flight) software package. This software provides elevation processing, 3-D terrain analysis, dynamic fly-through of terrain models, and linked viewpoint functionality in our GeoMedia environment. This software will be used on existing ImageStation equipment.

CONSISTANCY/FIT WITH THE ORGANIZATION's MISSION:
The Department of Transportation's mission is to "provide a transportation system that safely moves people and goods".
The Design Division's mission is "to acquire right of way and design highways that are safe, efficient, and effective in the movement of people and goods, while preserving our natural environment".
The purchase of these systems will help meet the mission of the Department of Transportation and the Design Division.

COST BENEFIT ANALYSIS

ANTICIPATED BENEFITS:
The benefits are as follows:
1. Replacement for existing optical stereoplotter – The stereoplotter operator will be able to work with digital images. This will increase productivity and capabilities. We will be able to continue the stereoplotter operations if the optical stereoplotter breaks down or the operator gets sick or leaves the DOT. The optical stereoplotter would be used only for work on projects that are currently started on or old completed projects that need updating.
Capturing feature data from stereo aerial imagery is one of the most time-consuming photogrammetry tasks. In fact, thousands of actions a day may be performed in this operator-intensive process. The feature collection capability minimizes the interaction required to collect or edit feature data, with easy-to-

use command menus and data forms. A user-definable feature table lets you define graphic characteristics that are automatically activated when selecting a feature to digitize.

2. Increased capabilities for CADD editors – The CADD editors will have the ability to check problem areas where the data is unclear. This will help the stereoplotter operators, in that they will not have to stop working on a project and start on the project that the CADD editor has a problem with.

The CADD editors will have the ability to add data to existing project digital data that is requested by the highway designers.

The CADD editors will have the ability to act as backup stereoplotter operators in time of need, such as a need for a rush project.

3. Increased capabilities for hydraulic analysts – The hydraulic analyst will be able to make better decisions on hydraulic problem areas, because they will be able to see drainage patterns in 3-D. more accurate areas, slopes, and elevations can be determined.

4. Increased capabilities for highway designers – The highway designers will be able to make better highway designs, because they will be able to see the effects of their created designs by using 3-D digital images.

COST ESTIMATE:

UNITS	PART NUMBER	DESCRIPTION	UNIT PRICE	ESTIMATED COST
30	SFT00446	Image viewer software	$495	$14,850

4	SFC00700	SSK Standard configuration
		Included software:
		    ImageStation Photogrammetric Manager
		    ImageStation Stereo Display
		    ImageStation Feature Collection
		Included hardware:
		    Wildcat 7110 Graphics card
		    Stereo sync wireless glasses
		    SSK 3D Softmouse with interface
		    5 volt power supply
		    Stereo Emitter
			$19,500	$78,000

3	SFC00800	SSK PRO Standard configuration
		The included hardware & software is the same as the SSK standard configuration shown above plus the following additional software:
		    ImageStation Model Setup
		    ImageStation DTM collection
			$28,500	$85,500

7	DP2070SB-BK	22" (or larger) CRT Monitors with @ least 120 Hz refresh rate.	$700	$4,900
1	SJBX878AA-0502A	Geomedia Terrain	$3,000	$3,000
1		Freight charges (Actual cost)		
TOTAL HARDWARE & SOFTWARE COSTS				**$186,250**
MAINTENANCE COST/FIRST YEAR				
UNITS	PART NUMBER	DESCRIPTION	UNIT PRICE	ESTIMATED COST
30	SFT00446	Image viewer software maintenance/first year	$84	$2,520
1	SJBX878AA-0502A	Geomedia Terrain maintenance/first year	$612	$612
TOTAL FIRST YEAR MAINTENANCE COSTS				**$ 3,132**
GRAND TOTAL				**$189,382**

MAINTENANCE COST/YEAR (after first year)

UNITS	PART NUMBER	DESCRIPTION	UNIT PRICE	ESTIMATED COST
30	SFT00446	Image viewer software maintenance/first year	$84	$2,520
4	SFC00700	SSK Standard configuration maintenance/first year	$3,120	$12,480
3	SFC00800	SSK PRO Standard configuration maintenance/first year	$4,560	$13,680
1	SJBX878AA-0502A	Geomedia Terrain maintenance/first year	$612	$612
		TOTAL YEARLY MAINTENANCE COSTS		**$ 29,292**

COST/BENEFIT ANALYSIS:

The cost of the optical stereoplotter was about $130,000.
The cost of a new Z/I Imaging ImageStation stereoplotter (compatible configuration) is about $ 67,000.
The cost of the Z/I Imaging SSK Pro system is $ 28,500.
Therefore, the savings of replacing the optical stereoplotter with a Z/I Imaging SSK Pro System would be about $101,500. this will have all the same functions as the optical stereoplotter except the ability to do analytic triangulation. Analytic triangulation will be done on the existing Z/I Imaging ImageStation. The savings of using the Z/I Imaging SSK Pro system over purchasing a new ImageStation is $ 38,500.
It is impossible to purchase a new optical stereoplotter instrument and the software to work with them, therefore we need to switch to digital equipment and software. This would be a cost avoidance benefit, because it will now be expensive to repair our existing equipment, if we could find the parts.

The cost of not having this capability would be large. We would have to have more staff working in the field, replacing the stereoplotter operation, surveying by ground methods. The cost of the field staff would be about $150,000/year, plus survey equipment costs, and vehicle costs. To get FTE authorization would be next to impossible. Plus it would be going backwards in technology and would waste money.

Using the existing staff to replace the stereoplotter function would result in less projects completed per year. The DOT would have to consult more work at higher costs and longer time frames. This would require projects to be delayed and federal funding would be lost. The loss of federal funding and less projects would result in a deteriorating infrastructure.

Providing 3-D capabilities to the hydraulic analysts and the designers will give them the ability to use already available digital data, to better analyze drainage patterns and existing topographic features.

Studies have shown that using multi-monitor configurations increase user productivity by about 10 %. A multi-monitor gives the user the ability to access more information and images simultaneously and to move and size a variety of information across screens. This could have a yearly productivity savings of about $3,000 in Surveys & Photogrammetry.

PROPOSED SOLUTION

PROPOSED SOLUTION/PROJECT APPROACH:
Based on the research we have conducted, it is recommended that we acquire the Z/I Imaging hardware, software, and the seven monitors. The Z/I Imaging system would be sole source. The seven monitors would not be sole source.

ALTERNATIVES CONSIDERED	WHY CHOSEN / NOT CHOSEN
Continuing operation as is. In other words DO NOTHING.	No benefits gained. Lost productivity if existing equipment dies. DOT will have to hire other staff or consult out the work at higher costs and longer time frames to complete the work.
Purchase Z/I Imaging software and hardware.	This software and hardware is compatible with our existing equipment and software. Any other system would create compatibility problems, wasted cost to try to interface with our existing system, or purchase a new system to replace existing digital system.

BUDGET / RESOURCES:

ESTIMATED COSTS			
TYPE OF OUTLAY	**INITIAL (Development)**	**ANNUAL (Recurring)**	**REMARKS**
ESTIMATED HARD COSTS			
Hardware	$ 4,900		Seven monitors
Software & hardware combined	$ 181,350		
Supplies			
User Training			
Software Maintenance	$ 3,132	$ 29,292	
Other (freight charges)	Actual cost		
SUBTOTAL	$189,382	$ 29,292	
ESTIMATED RESOURCES / PERSONNEL			
Internal staff hours	480		
Contracted services (training for 1 week)	$ 9,350		
Project Management			
SUBTOTAL			
GRAND TOTAL			